

MERCHANDISING SYSTEM

CROSS-REFERENCE TO RELATED PATENT APPLICATIONS

[0001] The present application claims the benefit of and priority as available under 35 U.S.C. §§ 119-121 to the following U.S. Patent Application (which is incorporated by reference in the present Application): U.S. Provisional Patent Application No. 60/478,700 ("MERCHANDISING SYSTEM") filed June 13, 2003.

BACKGROUND

[0002] The present invention relates generally to the field of merchandising systems. In particular, the present invention relates to merchandising systems providing for orderly presentation of articles (such as products) in a display space.

[0003] It is known to provide for a merchandising system that may be used for displaying products in consumer settings such as grocery stores, retail outlets, shops, etc. Such known merchandising systems may be used to present, display and store products in fixed or limited spaces such as on shelves, in display cases, in cabinets, etc.

[0004] It is beneficial when merchandising an article such as a product to allow potential customers to view or handle it in a convenient and comfortable manner. Known merchandising systems may display products to a consumer by providing the products in inefficient configurations. Products and product containers come in a variety of sizes and shapes, and some products may be more difficult to merchandise (e.g., present for potential retail sale) than others. Within fixed or limited spaces, known merchandising systems may not be configured to optimize the presentation of such products to a consumer. Such known merchandising systems also do not always provide convenient ways for dispensing products, especially those with unique or irregular shapes. Ease of use can be an important concern for customers and store personnel. As is sometimes the case, product or container design may be dictated by considerations separate from the ease or difficulty with which the product may be presented.

[0005] Some known merchandising systems may not provide effective means for displaying, storing and presenting articles that are difficult to stack or support themselves. For example, the packaging of many articles, such as lunchmeat or cheese, is often made from thin, deformable plastic which is not ideal for stacking or arranging on a flat platform.

Some merchandising systems fail to provide adequate support for these types of articles, as well as smooth, efficient sliding of the article along the length of the system. Further, some merchandising systems do not provide sufficient means of advancing these types of articles along the merchandising system. Further, some merchandising systems do not provide strong and/or rigid support for articles. Accordingly, many merchandising systems may not provide articles in a straight, linear, or level arrangement due to sagging, deformation, bowing, deflection and/or movement due to the weight of the articles. In addition, many merchandising systems may not evenly distribute weight from articles and/or product along the length of the system. This may result in a higher force when loading or stocking the unit (e.g., some spring pusher systems may require higher spring tension).

[0006] Accordingly, it would be advantageous to provide a merchandising system that is configured for stocking, orderly presentation, and convenient storage of products with a shape that may not be easily stored, presented, or displayed, such as products with uniquely shaped containers. It would also be advantageous to provide a merchandising system that is configured for selective modularity in the construction and assembly of the merchandising system. It would also be advantageous to provide a merchandising system that allows for the construction and assembly of a merchandising system with any number of product facings, modules, compartments, etc. It would also be advantageous to provide a merchandising system that advances a product and/or allows a product to advance along a defined path. It would also be advantageous to provide a merchandising system that self-faces articles (e.g., moves articles to the front of the system after articles are removed). It would be advantageous to provide a merchandising system that conveniently advances articles in systems where the articles are suspended and/or hang from members such as rods. It would also be advantageous to provide a merchandising system that may withstand large vertical forces when in an extended position, a stowed position, or any position therebetween. It would also be advantageous to provide a merchandising system that may evenly distribute the weight of articles and/or products over the length of the system. It would also be advantageous to provide a merchandising system that allows for smooth, efficient gliding of articles and/or products along the length of the system.

[0007] It would be advantageous to provide a merchandising system or the like of a type disclosed in the present application that provides any one or more of these or other advantageous features.

SUMMARY

[0008] The invention relates to a merchandising system for articles comprising a biasing system comprising a track comprising a front and a rear, a mount, a biasing mechanism, and a pusher. The mount is configured to couple with a base and the biasing system is configured to move the articles from the rear of the track to the front of the track.

[0009] The present invention also relates to a merchandising system for articles comprising a base, a member coupled to the base having a front and a rear and configured to suspend the articles, and a pusher that advances along the member so that articles are advanced from the rear to the front of the member. The member is positioned substantially above the pusher as the articles are advanced along the member.

[0010] Another embodiment of the present invention relates to, in a system for merchandising products suspended from a member, an improvement comprising a track adjacent to the member and having a front and a back and a pusher coupled to the track and configured to advance products suspended from the member from the back of the track to the front of the track. The pusher comprises an aperture that the member at least partially extends through as the pusher advances along the track.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIGURE 1 is a front perspective view of a merchandising system according to an exemplary embodiment.

[0012] FIGURE 2 is an exploded front perspective view of the merchandising system according to an exemplary embodiment.

[0013] FIGURE 3 is a top plan view of the merchandising system according to an exemplary embodiment.

[0014] FIGURE 4 is a side view of the merchandising system according to an exemplary embodiment.

[0015] FIGURE 5 is a front plan view of the merchandising system according to an exemplary embodiment.

[0016] FIGURE 6 is an exploded front perspective view of a merchandising system according to an alternative embodiment.

[0017] FIGURE 7 is front perspective view of a merchandising system according to an exemplary embodiment.

[0018] FIGURE 8 is an exploded front perspective view of the merchandising system according to an exemplary embodiment.

[0019] FIGURE 9 is a top plan view of the merchandising system according to an exemplary embodiment.

[0020] FIGURE 10 is a side view of the merchandising system according to an exemplary embodiment.

[0021] FIGURE 11 is a front plan view of the merchandising system according to an exemplary embodiment.

[0022] FIGURE 12 is a front perspective view of a merchandising system according to an alternative embodiment.

[0023] FIGURE 13 is a lower front perspective view of a merchandising system according to an exemplary embodiment.

[0024] FIGURE 14 is a detailed view of a portion of a merchandising system according to an exemplary embodiment.

DETAILED DESCRIPTION

[0025] Referring to the FIGURES, various exemplary and alternative embodiments of a merchandising system intended for displaying articles such as products, containers, items, units, etc. in consumer settings such as grocery stores, retail outlets, shops, etc. are shown. According to a preferred embodiment, the merchandising system is intended to dispense, store, merchandise, display, etc. articles to provide for the space-efficient presentation of groups of articles within a given or fixed display area, and/or to allow for convenient and orderly presentation, dispensing, stocking, and storage of articles (such as products or product containers) having any of a wide variety of sizes, shapes, and profiles (e.g., wedges, cylinders, rectangular, non-rectangular, etc.).

[0026] FIGURES 1 and 2 show a merchandising system 10 (e.g., tray system, shelf system, display system, case, divider system, storage system, modular system, etc.) according to an exemplary embodiment. As shown in the FIGURES, merchandising system 10 comprises a base 20, an extended portion 39, a mount 64, and a biasing system 82.

[0027] According to an exemplary embodiment shown in FIGURE 1, system 10 includes a base 20 (e.g., frame, support, support system, member, bar, etc.) comprising apertures 22 (e.g., openings, slots, etc.) and having a front surface 28, a back surface 30, an upper surface 32, and a lower surface 34. As shown in FIGURES 1, 2, 4, 6, and 13, base 20

is a substantially hollow bar and comprises a generally rectangular configuration. According to a particularly preferred embodiment, the bar is commercially available under the name MAGNA-BAR™ from Cannon Equipment Company of Rosemount, Minnesota. According to various alternative embodiments, the base may be partly or substantially solid throughout and a wide variety of bars, shafts, rods, poles, supports, frames, beams, etc. may be provided with the merchandising system. According to alternative embodiments, the number, size, position, overall configuration (e.g., triangular, circular, etc.) of the bar may vary. Base 20 is intended to provide support for extended portion 39.

[0028] As shown in FIGURES 1-13, extended portion 39 (e.g., frame, base, tray, shelf system, holder, support system, etc.) is provided for use with system 10. According to an exemplary embodiment, extended portion 39 comprises a member 38, a track 50, and a biasing system 82. Member 38 (e.g., hanger, peg, arm, guide, rod, hook, shaft, wire, beam, bar, etc.) comprises a body portion 40 (e.g., member, center section, etc.) having a first end 42 and a second end 44. Body portion 40 is configured to receive and support (e.g., suspend) articles in system 10 between first end 42 and second end 44 and allow removal of articles at first end 42. Articles may be placed on body portion 40 at first end 42 (e.g., by placing body portion 40 through apertures on a product container) and moved along body portion 40 until reaching a desired position along body portion 40. Body portion 40 has a generally uniform circular cross-section and is configured to have a longitudinal axis that extends substantially parallel to the z-axis in FIGURES 1 and 7. According to various alternative embodiments, the member may have a cross-section of various shapes (e.g., triangular, rectangular, oval, etc.) and its longitudinal axis may be other than straight, such as curved or arched. According to various alternative embodiments, the cross-section of the member may be non-uniform along its length and/or width.

[0029] As shown in FIGURES 1-12, first end 42 comprises a hook or curve 46 and projections 48. Curve 46 is intended to facilitate the stocking and loading of articles onto member 38 while providing resistance against removal or dispensing of articles. Curve 46 helps prevent articles from being pushed off member 38 by biasing system 82. According to an exemplary embodiment shown in FIGURES 1, 7 and 14, curve 46 extends upward from member 38 at first end 42 in an at least partially vertical direction (e.g., along the y-axis in FIGURES 1 and 7). According to various alternative embodiments, the curve may extend in any suitable direction and/or directions (e.g., downward, sideways, up and down, spiral, etc.). According to an alternative embodiment, the curve may extend sharply upward

at a 90 degree angle relative to the member at the first end. Second end 44 of member 38 is preferably configured to be positioned within apertures 22 of base 20. According to various exemplary embodiments, the second may comprise locking mechanisms or portions intended to maintain the member in a substantially horizontal configuration (e.g., substantially parallel to the z-axis).

[0030] According to an exemplary embodiment as shown in FIGURES 1, 2, 7 and 8, member 38 comprises projections 48 (e.g., extensions, protrusions, interfaces, stops, bumps, bulges, etc.). Projections 48 protrude from member 38 proximate first end 42. Projections 48 are configured to provide resistance to articles on the member which are being biased toward first end 42 by biasing system 82. As shown in FIGURES 1, 2, 7 and 8, member 38 includes two projections 48 that protrude from opposite sides of member 38. According to an exemplary embodiment, projections 48 are each in the shape of a flattened semi-circle and extend from member 38 such that the longitudinal axis of member 38 and projections 48 are substantially coplanar. According to various alternative embodiments, the shape, location, number, overall configuration, etc. of the projections may vary. For example, the member may include more than two projections that each have varying shapes (e.g., triangular, rectangular, etc.).

[0031] As shown in FIGURES 1-13, extended portion 39 comprises track 50. According to an exemplary embodiment shown in FIGURES 2 and 8, track 50 comprises a frame 52, flanges 54, and an end portion 58 (e.g., cap, barrier, etc.). Frame 52 (e.g., base, member, guide, beam, support, etc.) is a substantially planar panel that is configured to extend generally coextensive with member 38. As shown in FIGURES 1-12, frame 52 extends substantially parallel to and at least some distance above member 38. According to various alternative embodiments, the frame may be located on any side of the member (e.g., above, below, etc.) and/or may be substantially non-parallel to the member.

[0032] According to an exemplary embodiment shown in FIGURES 1-12, track 50 also comprises flanges 54 (e.g., flanges, ridges, grooves, ribs, runners, supports, etc.). Flanges 54 provide support and strength to track 50. The overall shape and configuration of flanges 54 provides resistance against bowing and/or deflecting of track 50 as system 10 is used. According to an exemplary embodiment, flanges 54 are integrally formed with track 50. The flanges may be provided on an upper surface and/or lower surface of the track to provide an overall guide, track, or support upon which the biasing member may slide or otherwise travel. According to various alternative embodiments, the flanges may be formed

separately and then connected (e.g., coupled, attached, affixed, etc.) to the track by suitable attachment process (e.g., gluing, taping adhering, etc.). According to an alternative embodiment, the track may be formed as a solid shape (e.g., rectangular, circular, etc.) without using flanges. According to an exemplary embodiment shown in FIGURES 3 and 9, flanges 54 form channels 56 between each flange 54. Channels 56 may provide one or more paths for biasing member 84 to slide or travel along track 50.

[0033] According to an exemplary embodiment shown in FIGURES 3 and 9, flanges 54 are all approximately the same length. According to alternative embodiments, the flanges may be varied (e.g., length) to accommodate for other parts of the shelf assembly or merchandising system. The width and the height of the flanges may be varied to obtain maximum durability and are not necessarily continuous along the length of the surface of the track. For example, the flanges may include breaks or may vary in shape and/or height at different locations along their length. Flanges 54 may have a rounded surface. According to alternative embodiments, the shape of the surface (e.g., profile) of the flanges may vary. For example, the surface of the flanges may be rectangular, curved, triangular, ridged, wavy, etc. or any other friction reducing shape. According to another alternative embodiment, a separate piece or mat that includes the flanges may be attached to the surface of the base to achieve the same result. The number of flanges may vary according to the particular needs associated with each shelf assembly or the overall merchandising system. According to various exemplary embodiments, the size, shape, number, form, and/or configuration of the flanges may vary. The flanges may be made from any of a variety of materials. According to an exemplary embodiment, the flanges are made from a plastic material. According to exemplary embodiments, the flanges may be made from styrene, polypropylene, polycarbonate, ester, etc. or any other suitable material.

[0034] Referring to FIGURES 1-5 and 7-11, track 50 also comprises end portion 58 (e.g., front stop, stopper, block, cap, etc.) positioned proximate a front 62 of track 50. End portion 58 couples to front 62. According to the illustrated embodiment, end portion 58 and is intended to restrain movement of biasing system 82 as it is advanced toward front 62 of track 50. According to various alternative embodiments, the end portion may be used for other suitable functions such as providing resistance to articles urged along the track. According to an alternative embodiment shown in FIGURES 6 and 12, a signage 60 (e.g., display surface, label holder, sign, panel, cap, etc.) may be used in place of and/or with end portion 58 of FIGURES 1-5 and 7-11. Signage 60 couples to the front of the track. Signage

60 may hold various indicia which may be replaced or updated by removing the indicia from the surface of signage 60. According to an exemplary embodiment, indicia may be slid into a slot or channel provided on the front of signage 60. Signage 60 is configured to restrain the movement of the biasing member as it is urged toward the front of the track. According to various alternative embodiments, other suitable members may be coupled to the front of the track.

[0035] According to various exemplary embodiments, the signage and end portion may each be configured to receive or display indicia (e.g. text, graphics, display placards, signage, etc.). For example, indicia may be applied directly to the signage and end portion. According to an alternative embodiment, the signage and end portion may comprise one or more channels configured to hold and display indicia. The signage and end portion may be clear to increase visibility of the merchandising articles. This configuration allows the articles to be readily visible by minimizing the potential obstruction.

[0036] Referring to FIGURES 1-6, system 10 includes mount 64 (e.g., assembly, device, connector, etc.) that couples track 50 to base 20. According to a first exemplary embodiment shown in FIGURES 1-6, mount 64 includes two substantially parallel portions 66 (e.g., clips, clasps, etc.) spaced apart from one another and configured to couple to, mount to, affix to, mold to, fuse with, etc. base 20. Mount 64 forms a "U" shaped channel 65 that is adapted to fit over, or couple to, one or more sides of base 20, such as the MAGNA-BAR™ which is commercially available from Cannon Equipment Company of Rosemount, Minnesota. Mount 64 is shown integrally formed as part of track 50. According to various alternative embodiments, the mount may be coupled to the track with any suitable means (e.g., fasteners, adhesive, etc.). To secure mount 64 to base 20, the distal ends of portions 66 may include inwardly facing projections 68 (e.g., snap hooks) configured to snap over a distal edge of base 20 when "U" shaped channel 65 is positioned over base 20. As base 20 enters channel 65, base 20 pushes against projections 68, causing portions 66 to flex outwardly. When projections 68 clear the sides of base 20, the flex in portions 66 causes projections 68 to snap inwardly (e.g., toward one another), thereby securing base 20 in channel 65.

[0037] According to a second exemplary embodiment shown in FIGURES 7-12, the system may include mount 70 (e.g., assembly, device, connector, etc.). Mount 70 includes a pair of fasteners 72 that are configured to couple to, mount to, affix to, etc. the base. As shown in FIGURES 7-12, the base may be a "V" bar 78 that is commercially

available from Cannon Equipment Company of Rosemount, Minnesota. Fasteners 72 include two portions 74 adapted to fit over and around a channel 80 formed by "V" bar 78. Portions 74 include projections 76 that clip over mount 70 to secure "V" bar 78 to track 50.

[0038] Referring to FIGURES 1-12, system 10 includes biasing system 82. According to an exemplary embodiment, biasing system 82 includes a pusher or biasing member 84 and a biasing mechanism 92. Member 84 (e.g., pusher, follower, plate, pusher plate, pusher paddle, etc.) is provided for contacting and/or pushing against articles placed on member 38. As used in this disclosure, the term "pusher" generally refers to any device of any size and/or configuration that may be used to advance an article along the system, whether or not the pusher is actually pushed and/or pulled along the system. Member 84 includes a flat surface 86 for making contact with articles. Surface 86 includes an aperture 88 (e.g., slot, opening, etc.) intended to allow member 84 to move along the length of member 38. Member 84 includes one or more connectors 90 (e.g., channels, flanges, arms, fingers, etc.) configured to slidably engage or otherwise couple to flanges 54 provided on track 50. According to various alternative embodiments, the biasing member may be provided in a variety of sizes and shapes depending on the particular needs associated with the overall merchandising system.

[0039] According to various alternative embodiments, the biasing member may have a wide variety of shapes and/or configurations. For example, the biasing member may have a curved shape (e.g., curved, scoop, shovel-like, cup-like, bucket-like, etc.). Providing a biasing member with a curved shape may better accommodate certain shapes of articles. For example, the curved shape may better accommodate a bag of articles (such as chips, salty-snacks, etc.) while a biasing member of another shape (e.g., rectangular) may better accommodate a more fixed or rigid article (such as boxed products, etc.). According to an alternative embodiment, the biasing member located on a base may be provided with one or more apertures (e.g., cut-outs, reliefs, holes, etc.). The one or more apertures may advantageously reduce the amount of material needed to build and/or construct the biasing member, or alternatively reduce the weight of the biasing member.

[0040] According to an exemplary embodiment, system 10 includes biasing mechanism 92 (e.g., spring, coil spring, helical spring, elastic, biasing element, etc.). Referring to FIGURES 1-10, biasing mechanism 92 is configured to bias or urge member 84 toward first end 42 of member 38. Biasing mechanism 92 is connected to track 50 by a hook 94 that fits within a receiving area located proximate front 62 of track 50. According

to various alternative embodiments, the biasing mechanism may be attached to the track by any suitable means such as fasteners, clips, clamps or other connectors or connection methods. As shown in FIGURES 2 and 8, a coiled portion 96 of biasing mechanism is provided on a back side of member 84 such that when member 84 is retracted (e.g., pulled toward the back of the merchandising system), biasing mechanism 92 will bias member 84 in a forwardly direction (e.g., toward first end 42 of member 38). When member 84 is near front 62 of track 50, biasing mechanism 92 is at least partially relaxed. As member 84 is moved away from front 62 of track 50, the tension in biasing mechanism 92 is increased. According to an exemplary embodiment, the hook (or other suitable means) of the biasing mechanism is attached to the biasing member and the coiled portion is located proximate the front of the track. According to this embodiment, the biasing mechanism urges the biasing member toward the front of the track and member by applying a pulling force.

[0041] According to various exemplary embodiments, one or more base and/or track may be provided. The base and track may be provided on an existing merchandising system such as a shelf, grid system, display case, etc. The base and track may be configured to hold, display, retain, suspend, store, or otherwise receive articles (e.g., goods, displayed objects, etc.). The base and track provides for the space division and orderly and convenient presentation of such articles. The base and track may be configured to connect or couple adjacent systems into a larger overall merchandising system. According to a preferred embodiment, the base and track will have a "modular" construction and be configured for attachment or use with any other bases, tracks, shelves, or a variety of other existing merchandising systems, including shelving units, support surfaces, grids, brackets, hangers, etc.

[0042] According to various exemplary embodiments, the assemblies and components of the system may be constructed from a variety of suitable materials, including extruded or injection molded plastic, metals, metal alloys, aluminum, polymers, composites, ceramics, etc. A variety of plastics may be used for construction or assembly. For example, the track may be constructed or assembled from high-impact plastics, polymers, etc. Using plastic offers several advantages including that the pieces may be constructed in a variety of different colors, surface finishes, textures, opacity, etc. According to various alternative embodiments, a variety of other known or suitable materials may be used, including metals, alloys, composites, etc. For example, the base and member may be constructed from metal.

[0043] According to the various exemplary embodiments shown in the FIGURES, a merchandising system may be provided in a substantially horizontal arrangement (e.g., parallel to the z-axis of FIGURES 1 and 7). According to alternative embodiments, the elements and the assemblies of the various exemplary embodiments may be applied to a merchandising system provided at any orientation and are not limited to a substantially horizontal arrangement. The exemplary embodiments shown in the FIGURES may be dimensioned to fit any applicable merchandising system (e.g. shelf, display, grid, etc.). For example, the exemplary embodiments advantageously allow a single merchandising system to be used interchangeably with display shelf merchandising systems of different depths without limiting the storage capacity of the merchandising system to the storage capacity of the smallest merchandising shelf system by providing an enlargeable storage space.

[0044] The parts defining the space configured to store or display articles may be constructed and assembled as a single integrally formed piece or may be constructed and assembled from multiple parts. For example, the parts may be formed separately and then connected using a sonic welding process (or other suitable attachment technique). The parts may be arranged to form a storage space. Before an article is placed in the space of the merchandising system, the member may be positioned near the front wall. With the member positioned near the front of the wall, the size of the space available to accept articles is minimal. The biasing mechanism positions the member near the front wall of the merchandising system when no articles are loaded in the merchandising system.

[0045] Referring to FIGURE 1, merchandising system 10 may be initially loaded with articles by either manually member 84 toward second end 44 of member 38 and then loading the articles into the expanded space along member 38, or by loading the articles at first end 42 and having the articles move biasing member 84 towards second end 44 of member 38 as more articles are added to the space. As articles are loaded and member 84 is moved further from first end 42, the tension force in biasing mechanism 92 may increase. The tension developed in biasing mechanism 92 may cause member 84 to apply a force to the articles in merchandising system 10. The force applied by member 84 and biasing mechanism 92 may securably contain the articles on system 10. Additionally, the force applied to the articles positions or urges the articles toward first end 42 of member 38. Biasing mechanism 92 may be adjusted or configured so that the force applied to the articles by member 38 does not damage the articles.

[0046] Once loaded with articles, the merchandising system advantageously allows for the forward movement of the articles after an article is removed. When an article is removed from the front of the merchandising system, the remaining articles are positioned forward by the biasing mechanism to fill the void left by the removed article. Moving the remaining articles to the front of the merchandising system maximizes the visibility of the articles by eliminating the possibility that adjacent articles positioned near the edge of the display shelf system could obstruct the view of an article set back from the edge of the display shelf system. Additionally, the movement of the article to the front of the merchandising system reduces the difficulty of trying to reach an article positioned away from the front edge of a display shelf system. Furthermore, the forward movement also eliminates the need to manually reposition all of the remaining articles in the merchandising system after an article has been removed. The technique used to initially load the merchandising system may be used to reload the merchandising system as articles are removed. In an exemplary mode of operation, the new article is reloaded from the front of the merchandising system as it remains incorporated with the display shelf system.

According to an exemplary embodiment, the member is mounted to a base system, such as a MAGNA-BAR™ or a "V" bar. The track is mounted to the base system such that the track is positioned above the member. The biasing member and biasing mechanism are provided on the bottom side of the track, and the opening in the biasing member allows the face of the biasing member to substantially surround the member. This configuration allows the merchandising system to apply a generally uniform force around the member, which helps to prevent articles from twisting on the member. If an article were to twist while on the member, it could bind and prevent the merchandising system from operating properly. The force (generally uniform) applied by the biasing member is advantageous because it helps to ensure that the merchandising system functions properly.

[0047] According to exemplary embodiments, the merchandising system may be used with different base systems. For example, the merchandising system may be configured such that the track snaps onto a MAGNA-BAR™. According to alternative embodiments, the merchandising system may be configured such that the track is clamped to a "V" bar. According to other embodiments, the track may be configured to couple to a variety of different base systems (e.g., other than a MAGNA-BAR™, a "V" bar, or of other types of bars and systems).

[0048] It is important to note that the above-described preferred embodiments are illustrative only. Although the invention has been described in conjunction with specific embodiments thereof, those skilled in the art will appreciate that numerous modifications are possible without materially departing from the novel teachings and advantages of the subject matter described herein. Accordingly, these and all other such modifications are intended to be included within the scope of the present invention as defined in the appended claims. The order or sequence of any process or method steps as recited herein may be varied or re-sequenced according to alternative embodiments. In the claims, any means-plus-function clause is intended to cover the structures described herein as performing the recited function and not only structural equivalents but also equivalent structures. Other substitutions, modifications, changes and omissions may be made in the design, operating conditions and arrangements of the preferred and other exemplary embodiments without departing from the spirit of the present invention.